

REMARKS

Claims 1-26 are all the claims pending in the application.

Objections

Claim 16 is objected to because of a misspelled word. Claim 16 is amended herein to correct the spelling of "vibrators," thereby overcoming the objection.

The drawings are objected to, because the Examiner believes that the drawings do not show every feature of the claims. With respect to claim 1, Applicant submits that the drawings do show the piezoelectric layers to which the electric fields are applied, as recited in claim 1. Also, as described in the specification at page 26, lines 14-20, for example, the magnitude of the electric field applied to the piezoelectric member that is thicker than the others (e.g., 31c in FIG. 3) is reduced relative to the electric field applied to each of the other piezoelectric members. Thus, the objection to the drawings based on claim 1 is believed to be overcome.

Regarding claim 19, the counterbalancing bending moment producing portion is shown in FIG. 3, for example. The counterbalancing bending moment MB is shown in FIG. 4. As described in the specification, at page 22, lines 6-23, the thickness of piezoelectric member 31c, for example, can be selected to generate a bending moment MB that will cancel out the bending moment MA. Thus, piezoelectric member 31c can be considered to be a counterbalancing bending moment producing portion. Hence, this feature of the present invention is shown in the figures.

*6/c 31c thicker than 31
when apply piez
31c is less contract than 31 -> cancel bending*

Claim Rejections

Claim 1 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

This rejection is believed to be overcome by the proposed amendment to claim 1. More

specifically, the amendment to the claim makes it clear that it is the electric field between the common and segment internal electrode layers that is applied to the piezoelectric layers.

Also, the Examiner asks what a counterbalancing bending moment producing portion is. The answer to this question can be found in the explanation directed to the objection to the drawings. Based on that explanation, the term “counterbalancing bending moment producing portion” is believed to be definite.

Furthermore, claim 1 is amended to add an antecedent basis for “magnitude,” thereby overcoming this basis for rejection of claim 1.

Claims 1-6, 10-13, and 16-18 are rejected under 35 U.S.C. § 102(b).

Claim 1 requires that the magnitude of the electric fields applied to the piezoelectric layers be non-uniform. However, Applicant submits that Kitahara fails to teach or suggest this limitation. The Examiner refers to FIG. 3 of Kitahara as disclosing this limitation of the present invention, but the reference does not appear to even suggest anything about electric fields applied to the piezoelectric layers. Therefore, claim 1 and its dependent claims 2-4 and 16-18 are believed to be allowable over the prior art.

Also, Kitahara does not teach or suggest that the piezoelectric layers are non-uniform in thickness and that the internal electrode layers are non-uniform in thickness, as required by claims 5 and 10, respectively. Instead, the figures (1, 3, and 7) of the reference appear to show piezoelectric layers having uniform thickness and electrode layers 3 and 4 having uniform thickness. Furthermore, there appears to be no support in the specification for the assertion that the piezoelectric and electrode layers are non-uniform. That is, even if one of the figures is

interpreted to have layers of thicknesses that are not exactly the same, such a difference is seen to be a drafting imperfection, since the specification of Kitahara does not provide support for piezoelectric layers having non-uniform thickness and internal electrode layers having non-uniform thickness.

Moreover, Kitahara is not directed to the thickness of piezoelectric layers and internal electrode layers. Rather, the reference is directed to expanding a deformation region of a piezoelectric material by providing slit having an inclined face.

Therefore, claims 5 and 10 and their respective dependent claims 6, 16-18 and 11-12, 16-18 are believed to be allowable over the prior art.

With respect to claim 13, Applicant presents the following comments in traversal of the rejection. In Kitahara, rear ends of internal electrodes 3 are elongated to be in parallel to an inclined slit, and therefore the lengths of the internal electrodes 3 are different from each other. Furthermore, one of ordinary skill in the art would know that the length of the internal electrode is closely related to a magnitude of electric field applied to a piezoelectric layer (see the first full-paragraph of page 31 of the present application). Therefore, Kitahara suggests that the magnitude of the electric field applied to the piezoelectric layers is non-uniform. Also, it appears that the electric field in Kitahara would be distributed so as to increase the bending moment.

Amended claim 13 requires that the length of the at least one internal electrode layer located away from the surface fixed to the fixing member, is shorter than other internal electrode layers located between the at least one internal electrode layer and the first surface. In Kitahara, however, a corresponding internal electrode layer is longer than the other electrode layers.

AMENDMENT UNDER 37 C.F.R. § 1.111
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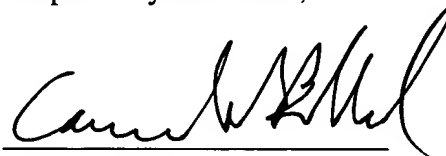
Therefore, claim 13 is believed to be allowable over the prior art.

Also, claim 19 and its dependent claims 20, 21, and 23 are allowable over the prior art, at least because the applied prior art fails to teach or suggest a counterbalancing bending moment producing portion that produces a bending moment canceling a bending moment caused during contraction of the piezoelectric vibrator. Kitahara does not even suggest such a feature.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) A piezoelectric vibrator unit comprising:

at least one piezoelectric vibrator including:

common internal electrode layers and segment internal electrode layers arranged alternately;

piezoelectric layers, each interposed between adjacent pair of the common and segment internal electrode layers; and

external electrodes formed on an exterior of the piezoelectric vibrator and electrically connected respectively to the common internal electrode layers and the segment internal electrode layers; and

a fixing member to which a surface of the piezoelectric vibrator is fixed;

wherein the piezoelectric vibrator is displaceable in a direction perpendicular to a lamination direction in which the internal electrode layers and piezoelectric layers are laminated;

wherein a magnitude of electric fields applied between the common and segment internal electrode layers to the piezoelectric layers is non-uniform to cancel a bending moment caused during contraction of the piezoelectric vibrator.

13. (Amended) A piezoelectric vibrator unit comprising:

at least one piezoelectric vibrator including:

common internal electrode layers and segment internal electrode layers arranged alternately;

piezoelectric layers, each interposed between adjacent pair of the common and segment internal electrode layers; and

external electrodes formed on an exterior of the piezoelectric vibrator and electrically connected respectively to the common internal electrode layers and the segment internal electrode layers; and

a fixing member to which a first surface of the piezoelectric vibrator is fixed;

wherein the piezoelectric vibrator is displaceable in a direction perpendicular to a lamination direction in which the internal electrode layers and piezoelectric layers are laminated;

wherein a length of at least one of the internal electrode layers, located away from the surface fixed to the fixing member, is shorter than other internal electrode layers located between the at least one internal electrode layer and the first surface.

16. (Amended) The piezoelectric vibrator unit according to one of claims 1, 5, 9, 10, 13, 14 and 15, wherein said at least one piezoelectric vibrator includes comb-like piezoelectric [vibratos] vibrators constructing a piezoelectric vibrator group.